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INTERNATIONAL INVENTIONS EXHIBITION, LONDON.

REPORT ON THE EXHIBITS RELATING TO THE CHEMICAL INDUSTRIES.

BY WATSON SMITH,

Lecturer in Chemical Technology in the Victoria University, Manchester, etc.

(Continued from page 527.)

GLASS, POTTERY AND EARTHENWARE.

Henry Knowles, Burton-on-Trent (*Group XXIII. No.* 1759).

Improvements in kilns :—(1.) Models of patent continuous or semi-continuous direct-action kilns. (2.) Models of patent detached down-draught ovens and kilns, with continuous direct action. (3.) Model of patent fireplace for kilns, ovens, glass and other furnaces. (4.) Model of patent binding for kilns, ovens, etc. (5.) Model of patent perforated bottom for kilns, ovens, etc. (6.) Samples of sanitary pipes, firebricks, tiles, terra-cotta, etc., burnt in H. Knowles' patent kilns.

Candy & Co., Limited, London (*Group XXIII. No.* 1763).

(1.) Patent vitreous buff, red and glazed terra-cotta. (2.) Patent terra-cotta and stoneware-facing and paving bricks. (3.) Patent kiln for burning these bricks and glazed stoneware, sanitary pipes and appliances.

Thomas Webb & Sons, Stourbridge (*Group XXIII. No.* 1768).

Various new methods and improvements in the manufacture and decoration of crystal and coloured glass, etc,

W. Douglas Herman, St. Helens (*Group XXIII. No.* 1773).

Improvements in the combination of refuse materials of glass-works with other substances for the purpose of making flags, bricks, tiles and other like fictile or vitreous articles ; also filter stones, grindstones, etc., these improvements being also applicable to the case of similar materials from other sources than glass-works.

The Glenboig Union Fire Clay Co., Limited, Glasgow (*Group XXIII. No.* 1776).

(1.) Dunnachie's patent continuous regenerative gas kiln for burning fire-bricks, sanitary ware, pottery, etc., without smoke. (2.) Dunnachie's patent drying stove. (3.) Dunnachie's Star heating stove. (4.) Improved fire-clay and silica bricks.

Henry Braun, London and Paris (*Group XXIII. No.* 2719).

Specimens of fire-proof china, adapted for cooking utensils.

The Toughened Glass Co., Limited, London (*Group XXIII. No.* 1784).

Toughened crystal table glass, plain and decorated. Toughened lamp glasses. Toughened glass for chemical and laboratory use, etc.

F. Siemens, Dresden (J. Batt & Co., London) (*Group of Foreign Exhibitors, No.* 2720).

The manufacture of hard glass.

BUILDING MATERIALS, MORTARS, CLAYS, CEMENTS.

A. C. Ponton, Dorset (*Group XIV. No.* 1467).

Improvements in the processes of manufacturing artificial stones and concretes, so as to greatly reduce the quantity of silicate of lime, binding the sand and other aggregates.

Lime water, or the finest milk of lime, is boiled with either the finest sand, or dust from stoneware or natural stones, and a little soluble silica is introduced. Boiling under pressure would no doubt lead to the lime combining with the silica, but as this is inconvenient in practice, the fabricated articles after being dried in steam are boiled in a weak bath of silicate of soda. The silica, in separating from its solution of soda, combines with the lime forming crystallised silicate of lime, and the soda recombines with the free soluble silica. Sometimes the proportions of lime may render it difficult for the silica to penetrate through the mass; in this case dry powdered silicate of soda is rapidly introduced just before casting the stone or concrete. The dry silicate of soda fortunately takes a sufficient time to dissolve, so that chemical combination does not commence until the particles or aggregates are settled in position. This is important, since it was found that if the silicate of soda be introduced in solution amongst the "aggregates," disintegration ensues.

Still another method is open for adoption.

Even for artificial stone, as well as for concretes, a porous aggregate is often adopted, such as chips of stone, for the sake of conferring greater density. Advantage may be taken of this to introduce the silicate of soda into the fabric in a dry state, because it is easy for the porous aggregate to absorb weak silicate of soda, and subsequently lose the water by evaporation, and hence when such aggregates are incorporated with the stones or concretes the water introduced for producing plasticity forms a medium in which the chemical change of the lime into the crystallised silicate can take place, as well as the recombination of the soda with the free soluble silica. The result of these methods is, as seen in the exhibits, that one part of lime binds together as much as 1000 parts of other aggregates, and it has been found by experiment that a certain amount of cohesion is even attained when one part of lime is mixed with 10,000 parts of other aggregates, but the cohesion is so feeble that the chemical recombinations cause disruption when the articles are boiled in the silica bath, although by taking precautions no doubt this difficulty could be overcome; thus, processes could be adopted in which the boiling would be unnecessary. It may be added that present manufacturers of artificial stone or concrete, as a rule, consider one part of cement to ten parts of other aggregates is the limit for successful manufacture.

METALLURGY AND MINING, ETC.

S. G. THOMAS AND P. C. GILCHRIST, LONDON (*Group II. No. 156, and XIV. No. 1467*).

The Basic- or Thomas-Gilchrist process for making steel and ingot-iron from phosphoric pig in the Bessemer and Siemens furnaces.

The exhibit comprises specimens of:—

(1.) The dolomite used for making the shrunk-lime lining material.

(2.) The shrunk-lime lining material before it is mixed with tar.

(3.) The lining material as used in the converter, prepared by grinding the shrunk material and mixing it with tar and heating to redness in a closed vessel.

(4.) The lime used for additions.

(5.) The steel and ingot-iron made.

(6.) The slag.

Of the steel and ingot-iron made there is a large number of test samples. These consist of specimens that have been tested very severely, both cold and hot, in the form of rails, girders, angles, beams, plates, tubes, wire, and black plates for tin plates. To illustrate how completely phosphorus can be eliminated, there are some samples of basic ingot-iron containing of phosphorus as little as 0·014 per cent., of C and Si traces, Mn=0·05 per cent., S=0·03 per cent., and Fe=99·90 per cent., made by the North-Eastern Steel Company from phosphoric pig.

The basic Bessemer process is represented by the North-Eastern Steel Company, in England; Hoerder Hütten Verein, in Germany; Les Aciéries d'Angleur, in Belgium; and Messrs. Schneider & Cie., in France. The basic Siemens is represented by The Brymbo Steel Company, in England, and Messrs. Schneider & Cie., in France. There is also a casket presented to Mr. Sidney Gilchrist-Thomas at Vienna, the figures of which are cast from the same pig as is used in the basic Bessemer converter, and the repousée work is of basic Bessemer ingot-iron made by the Prager Eisen Industrie Gesellschaft, Kladno, Austria. Before the introduction of this invention little more than one-eighth part of the available supply of iron ore in the world could be used for the manufacture of steel, owing to the presence, in the remaining seven-eighths, of too much phosphorus. The presence of phosphorus in steel is a fatal objection to its employment for many purposes, owing to the brittleness conferred upon it. The problem therefore which urgently awaited solution up to the year 1879, was how to eliminate phosphorus in the Bessemer converter and Siemens furnace, from the pig-iron made from the abundant but phosphoric ores, so that phosphoric pig might be converted into first-class steel and ingot-iron.

The exhibit illustrates the manner in which this result is accomplished by means of the Thomas-Gilchrist process—namely, by certain modifications of the Bessemer and Siemens processes, the chief of which are the manufacture and application of a durable basic-lining, and the making of large additions of ordinary lime to the molten bath, the effect of which practically is, *the complete removal of the phosphorus from the bath into the slag*.

Prior to this invention the furnace linings used were composed of sand, and with such a lining large additions of lime could not be effectively made, because of the chemical action of the lime upon the sand, resulting in "corrosion" or destruction of the sand lining. The Thomas-Gilchrist process is now in use in all the great iron-making countries of Europe; the make of basic ingot-iron and steel being from 70,000 to 80,000 tons per month.

ROBERT OXLAND, PLYMOUTH (*Group II. No. 115*).

Improvements in calcining ores or minerals; especially applicable for the smelting and reduction of ores of gold, silver, copper, tin and zinc, and for the manufacture of arsenious and sulphuric acids.

F. JONES & CO., LONDON (*Group II. No. 125*).

Utilisation of blast furnace slag for the following purposes:—

The manufacture of mantelpieces, paving-blocks, bricks, sand, etc.; also the manufacture of a glassy fibrous material (slag-wool), used for fire-proofing and sound-proofing buildings, and for purposes for which it is necessary to prevent the transmission of heat, cold or sound.

METALLIC SULPHIDES REDUCTION CO. (HOLLWAY'S PATENTS), LIMITED (*Group II. No. 130*).

Improvements in the production of sulphur from pyrites and the separation of metalliferous and other substances therefrom by rapid oxidation without the aid of fuel.

ROYAL MINT, LONDON (*Group II. No. 135*).

Refining gold by the aid of chlorine gas. A process devised by F. Bowyer Miller, of the Melbourne Mint.

G. J. SNELUS, WORKINGTON (*Group II. No. 136*).

Illustrations of improvements in the processes for the manufacture of steel and in the apparatus used for that purpose:—

(1.) Illustrations of the basic process of dephosphorisation. Mr. Snelus was the first to discover and to demonstrate by experiment that in order to eliminate phosphorus from pig-iron by the Bessemer process the converter must be provided with a lime or "basic" lining, and not be lined with the ordinary siliceous material.

(2.) Apparatus for carrying hot steel ingots.

(3.) Improved steel linings for Gier's soaking pits.

(4.) Improvements in moulds for steel ingots, etc.

HENRY R. CASSEL, LONDON (*Group II. No. 153*).

Extraction of gold from refractory ores by electrolysis.

ELECTRO-AMALGAMATOR CO., LIMITED, LONDON (*Group II. No. 154*).

Improved method of extracting gold and silver from their ores by the combined action of electricity and mercury.

PHOSPHOR BRONZE CO., LIMITED, LONDON (*Group II. No.* 162).

(1.) Phosphor bronze alloys for bearings and parts of machinery.

(2.) Silicium bronze wire for telegraph and telephone lines, electric lighting, and other purposes.

MANGANESE BRONZE & BRASS CO., LIMITED, LONDON (*Group II. No.* 163).

(1.) Manganese bronze for heavy castings, such as propellers cast under pressure for ordnance purposes, forgings, shafts, sheathing, plates, bearings, wire, etc.

(2.) White brass for axle brasses, and for filling bearings.

PYRITES SMELTING CO., LIMITED, LONDON (*Group II. No.* 172).

Huntington and Koch's amalgamating apparatus, to be used in the process for extracting precious metals (*gold and silver*) *from their ores*. It is also termed the gold amalgamator, and is an apparatus by which the pulp from the stamps may be readily passed through a column of mercury a foot or more in height. Good results are said to have been obtained in Australia. Huntington and Koch also propose to extract silver from ores by passing these after roasting through red-hot molten lead by means of an apparatus similar to the gold amalgamator.

ERNEST SCOTT & CO., NEWCASTLE-ON-TYNE (*Group II. No.* 173).

This firm exhibits Scott and Hilder's machine for extracting iron from other substances by means of electro-magnetism. By the use of this process engineers' refuse and mould-borings are at once rendered valuable, whilst ore can be very economically worked. Special attention is invited to the automatic manner in which the iron is released from the magnets.

THE COMPRESSED LIME CARTRIDGE CO., LIMITED, LONDON (*Group II. No.* 177).

Improved method of and apparatus for breaking down and getting coal and other minerals in mining, quarrying or tunnelling operations, by which all danger of igniting fire-damp in coal mines is avoided.

GEORGE BOWER, ST. NEOTS (*Group II. No.* 198),

Exhibits drawings of a Bower-Barff Furnace, and specimens of iron and steel rendered incapable of rusting by a process which consists in subjecting articles when at a red-heat to the action of superheated steam or air, by which the iron combines with the oxygen, and produces a coating of magnetic oxide not affected by ordinary atmospheric conditions.

BOHLER BROS. & CO., SHEFFIELD (*Group II. No.* 209).

This exhibit is illustrative of a process for utilising the spathic and brown ores of the Styrian Alps in the production of steel by the direct process, only charcoal being used for fuel. Samples are shown of Bessemer and Bessemer-Martin steel from the same ores.

FATS, OILS, AND SOAPS.

J. VEITCH WILSON & CO., GLASGOW (*Group XIV. No.* 1433).

Improvements in the manufacture of lubricating oils and oil for batching jute.

MESSRS. ENGELBERT & CO., LONDON (*Group XIV. No.* 1435).

This firm exhibits a lubricant termed an "anti-corrosive lubricant;" it appears to be a high-boiling mineral oil, and is guaranteed free from acid, spirit, odour, and to be uninflammable under ordinary circumstances.

MESSRS. MACKEY, MACKEY & CO., LONDON (*Group XIV. No.* 1446),

Exhibit a series of vegetable, animal and mineral oils. The firm states the special advantages possessed by its lubricants to be—Freedom from acid and from gum, freedom from drying properties, a high flashing point, low solidifying point, and that the lubricants have no action on the working parts of machinery beyond keeping them bright and clean.

PRICE'S PATENT CANDLE CO. (*Group XIV. No.* 1469).

Specimens of fatty acids prepared from tallow, etc., by a new process. This method consists in decomposing tallow, palm-oil, etc., in an autoclave, by means of the magnesium salt of a fatty acid or acids. The magnesium is recovered for use again by means of an alkaline salt of a fatty acid or acids.

Specimen of soap made from tallow de-glycerised by the above method and for comparison therewith. Specimen of *Primrose Soap made from the same neutral tallow.

Specimens of crude glycerine prepared by the foregoing process from tallow, palm-oil, and cocoa-nut oil. These illustrate the improvement which has been effected of late in the quality of crude glycerine by the introduction of improved methods of "autoclaving"—*i.e.*, saponifying in an autoclave at a high pressure with the aid of water and a small percentage of lime, zinc, magnesia, etc.

Solidified Glycerine Soap.—Soap made transparent by the addition of 50 per cent. of glycerine, and without the use of spirit. Recommended for the use of those whose hands are liable to become chapped after washing.

Specimens illustrating a new method of rendering cloth-oil perfectly safe—*i.e.*, of checking oxidation, and so preventing spontaneous combustion when cotton or wool is saturated with the oil. This method consists in the addition of a small percentage of soap to the oleine. This addition not only makes the oil safe, but otherwise improves its quality, increasing its "body" or lubricating value, and rendering it more readily removable in the scouring process.

Candles and Candle-making, etc.—1. Specimens of paraffin, semi-refined and refined paraffin wax, refined without the use of naphtha or other solvent. 2. Specimens of Price's Gold Medal Palmitin Candles, which combine the virtues of high-melting point paraffin and palmitic acid. The paraffin supplies high illuminating value and transparency, while the palmitic acid adds that strength which is necessary to prevent the guttering and bending that occur when paraffin candles are burned in a warm atmosphere. Wax and spermaceti are now practically obsolete candle materials, and it is claimed for the palmitine candles that they exhibit in a high degree the valuable characteristics of the modern and comparatively inexpensive materials—paraffin and stearin.

Price's Co. exhibit the following patented novelties and improvements :—

(1.) *The Making of Palmitin Candles with ends that may be called "self- and tight-fitting."*—Each conical end is formed by means of a cap fitted into the expanded end of the moulding pipe, and consists of a series of sharp or V-shaped flutes, which are readily abraded when the candle is being fitted into a candlestick. The caps are removed from the candles in a novel and ingenious way. They are laid on a popping-table attached to the machine, and the row of candles is simultaneously and instantly cleared from the caps by a series of wooden pistons moved by a lever.

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* "Primrose Soap" here means a best tallow soap like "XXX" or "Honey Pale Soap" of the North of England and Scotland, where, however, "Primrose Soap" signifies a common and "highly run" article, containing from 46 to 49 per cent. of water, a freshly made curd soap of the best quality, containing not more than 31 per cent. of water.

(2.) *The Moulding of Spiral Candles.*—Hitherto such candles have been prepared one at a time by cutting, but now Price's Co. mould them 96 at a time. The winding of these screw-shaped or spiral candles out of the rifled moulds is as pretty as it is novel, and has attracted much attention.

(3.) *The old style of Making Candles is illustrated, but with a modern improvement.*—Dips are still consumed, but they are now made self-snuffing. Messrs. Price have introduced a new way of making them. Instead of dipping the wicks they dip a series of steel skewers into the candle material, and after the candles have been formed and cooled, the steels are removed, and the wicks, cut to the required length and specially prepared, are inserted. This method entirely prevents the waste of wick which characterised the old style of dipping, and the saving effected covers the whole cost of the candle-maker's labour.

An improved wick-making machine is shown at work. In this machine an improved switching arrangement has been introduced, which renders possible the employment of large bobbins running at high speed.

All the novelties and improvements exhibited have been invented by officers of the company, and all the candle machines shown are of the company's manufacture.

J. & J. C. Field, London (*Groups XIV. and XI. Nos.* 1469 and 1192).

This well-known firm exhibits specimens (1) of soaps, (2) detergents, (3) disinfectants, (4) night lights, (5) candles, and (6) candle machines.

F. C. Calvert & Co., Manchester (*Group XIV. No.* 1466),

Exhibit samples of their well-known carbolic acid soaps. (See p. 475.)

J. Alexander & Co., Lambeth, S.E. (*Group XIV. No.* 1447),

Exhibit as a specialité a delicately-scented toilet soap, composed of the purest ingredients, and into which is introduced the extract of the fresh bark of the *hamamelis virginica* or common witch-hazel, which is known as "hazeline." This essence, chiefly composed in all probability of a phenolic substance, possibly analogous to *eucalyptol*, is distilled from the fresh green bark of the hamamelis, and has long been known as a valuable astringent remedy. According to the *Lancet*, "it has a fragrant odour and a cooling taste, and has a high reputation in the United States, where it is used in the treatment of eczema, ulcers, burns, etc. It has undoubtedly the power of arresting many forms of hæmorrhage." It is also stated by the *Medical Press and Circular* to be an admirable substitute for arnica, in all cases where the latter is usually prescribed, at the same time possessing advantages not offered by arnica. "Hazeline" is a colourless oil, possessing a peculiar, pleasant and pungent odour, and sweet astringent taste. It does not stain or soil, and produces a soothing and cooling effect when applied to irritated surfaces.

PAINTS, VARNISHES AND RESINS.

The Sankey White Lead Co., Warrington (*Group XIV. No.* 1467).

The "white lead" originally produced was, it is stated, deficient in density, and although possessing great opacity and a covering power superior to nearly all Dutch-made "white lead," was not liked by grinders, because its larger bulk when dry caused it to take longer to mix. This objection is now removed in an improved method of working, and a lead weighing 200lb. to the cubic foot is produced, without the other good qualities of the article being in the slightest interfered with. Still more important, however, is the announcement that by means of the improvements introduced in Mr. Ed. Milner's patent (Eng. Pat. 4053, November 22, 1875), this firm will very shortly be manufacturing that poisonous substance without the necessity of its being handled by the workmen in any way. On August 10, 1869, a patent (No. 2443) was taken out by J. Gallemore Dale and E. Milner, afterwards one by E. Milner (June 22, 1872, No. 1881). The improvements in the last patent are more especially in reference to the 1872 patent.

Finely-ground litharge is taken and mixed with a solution of common salt, in the proportion of 4lb. of dry litharge to 1lb. dry salt, the salt being dissolved in 16 parts, by weight, of water. The mixture is thoroughly agitated for about 4½ hours. The result is an insoluble basic chloride of lead. This basic chloride is now suspended in a solution of caustic soda and common salt. The mixture is then introduced into a lead-lined vessel, fitted with wooden beaters, and there subjected to the action of carbonic acid, beyond the point at which it ceases to show an alkaline reaction. The proper point of saturation is ascertained by a simple test, easily applied by the workmen. When the solution has ceased to show an alkaline reaction, the mixture is a viscid homogeneous mass, and if a portion be shaken in a half-empty glass, it will coat the sides and remain in a layer all over them; but when sufficient gas has been supplied, a small quantity shaken in a clear glass vessel coats the sides with a very thin layer, like frost on a window pane, and after standing for a few seconds the clear liquid separates from the carbonate of lead and leaves an arborescent pattern on the interior of the glass. Should this action of the gas have been continued too long, the product loses its value, becoming like sand, and not coating the glass at all, but settling rapidly out of the solution of salt.

The workpeople can tell to the greatest nicety, by this test, when to stop the supply of gas.

The carbonate of lead thus produced, after being washed to free it from salt, and being dried, is ready for use, and is stated to be of greatly-improved quality, compared with that formerly produced by the former patented method.

Thos. Griffiths, Oxton, Liverpool (*Group XIV. No.* 1443).

"GRIFFITHS' PATENT ZINC WHITE" (SULPHIDE OF ZINC).

This pigment is manufactured by Messrs. Griffiths, Berdoe & Co. (the Sanitary Paint Co., Limited), of Liverpool and London. It is claimed for this article that besides being non-poisonous, "it covers one-third more than white lead, and 100 per cent. more than zinc oxide." It is said to have no chemical action upon metals, if not discoloured by foul gases or bilge-water, is fire-proof and unaffected by a red heat. It is also said that most delicate tints or "tones" can be produced with it, not possible with lead. This zinc white is produced as follows:—Either zinc chloride or sulphate is precipitated by a soluble sulphide—sodium, calcium, and barium sulphides all having been used for the purpose—and precautions are taken lest any iron that may be contained in small quantities as an impurity in the zinc solution, should be precipitated with the sulphide of zinc. The precipitate being collected and dried, is transferred to a furnace, where it is calcined, and after careful stirring it is raked out, whilst quite hot, into vats of cold water, where it is levigated, and afterwards collected and dried. The result is stated by Dr. T. L. Phipson to be a white pigment of exquisite beauty, and possessing a covering power, when mixed with oil, greater than that of any known substance. Phipson's analysis shows that the substance consists of an oxy-sulphide of zinc, the composition of which varies somewhat, according to the duration of the calcination and the exact degree of heat attained. The best product appears to correspond very closely with the composition indicated by the formula $5ZnS+ZnO$. (See *Journ. Chem Soc.* for December, 1878.)

H. Bollman Condy, London (*Group XIV. No.* 1445).

The specimens exhibited illustrate what is termed a *new rapid innocuous* process for the manufacture of white lead [$2(PbO,CO_2)+Pb(OH)_2$] of the finest colour and body, of the exact composition of white lead made by the old Dutch process, and of equal density. In this process the workmen are not under the necessity of handling the white lead until the completion of the manufacture, which is effected in seven days, whereas by the old process four or five months are required. The body of this pigment is such that it requires to be ground with from 12 to 13lb. of refined linseed oil to the cwt. At first it appears somewhat thin, but in the course of twenty-four hours it will be found to be firm, and to have, it is said, the quality which has hitherto only been found in white lead which has been ground some months.

Donald Macpherson & Co., Manchester (*Group XIV. No.* 1469),

Exhibit specimens of the so-called Foo-Chow signal paints, a kind of enamel paints, possessing all the long-sought-for characteristics of the Chinese enamels, so much admired for their hardness and brilliancy on tea-trays and papier-maché articles imported from China. The paints have, on drying, an extremely hard, tough, glossy surface, are not affected by sulphuretted hydrogen and will not crack, blister, or scale off. They dry in five minutes, when a second coat can be applied.

The Foo-Chow lacquers are also valuable for printing pillar letter-boxes, and to machinists, japanners, or for any manufacturers who have to turn out their goods as soon as they are finished, and yet desire a highly-enamelled surface.

J. B. Freeman & Co., Battersea, S.W. (*Group XIV. No.* 1448).

This firm shows specimens of its patent "non-poisonous white lead," which mainly consists of lead sulphate of a specially prepared kind. This form of white lead is, according to the testimony of Prof. A. H. Church, superior to the best white lead made by the Dutch method, and is besides said to be really non-poisonous, both as regards workmen making it or using it. As an oil paint, it is free from the disagreeable odour of the ordinary article when ground in oil. In density, body and covering power, as well as in smoothness and the purity and beauty of its whiteness, Freeman's paint is at least equal to the best white lead of the old processes, and in some of the qualities named it is superior. Dr. H. C. Bartlett has proved by photometric observation of the quantity of light reflected by various samples of the purest zinc white, and by Freeman's white lead, that the whiteness of the latter exceeds that of the former. According to Prof. Church, when submitted for varying periods to the action of air containing sulphuretted hydrogen, surfaces of this paint remain unaffected, or were only very slightly tinged. It does not turn yellow or buff when a surface painted with it is excluded from light for some time—a well-known drawback in the use of white lead.

Now, though the basis of Freeman's "non-poisonous white lead," as already stated, is sulphate of lead, yet the pigment does not consist merely of sulphate of lead; also, the sulphate employed is no mere by-product, but is specially prepared from metallic lead. Many attempts have been made to utilise lead sulphate as a pigment, but without success, the product being quite useless, possessing neither the necessary density, body nor opacity. Moreover, a large quantity of oil is required in grinding it, and as a paint it is what painters term "slimy," and works very badly under the brush.

It was found, however, that by adding about 25 per cent. of zinc oxide (in itself a substance possessing neither good body nor density), and subjecting the mixture to great friction and pressure under heavy edge runners, a complete change is effected in the characters of the substances employed, which it would appear impossible that any mere mixture could effect; and a pigment possessing great density and opacity, and of exceeding whiteness, is the result. The whiteness is said to be greater than that of the finest white lead made by the Dutch process. As regards density, 3 cubic feet of lead sulphate, weighing 170lb. per cubic foot, and 1 cubic foot of zinc oxide, weighing 58lb., when mixed together and treated by the above process, yield the pigment in question, weighing over 200lb. per cubic foot.

The following experiment was made by Prof. Church, with this white pigment, and the description of it is given in his own words:—

"On a sheet of glass three large patches of three different paints were spread with a spatula. The three paints were all ground in linseed oil, they being respectively, (A) Freeman's white lead; (B) Dutch process white lead; (C) zinc white. The sample C had been ground in oil so long ago as 1879. Before the patches of paint had dried at all, a few drops of dilute sulphuric acid (Brit. Pharm. strength) were poured upon them and well mixed with an ivory knife. No saponification with C has occurred, and, therefore, no mixture of acid and paint could be effected. With B the saponification of the oil was complete. With A, saponification had occurred to a very marked degree, quite sufficient for the purpose of causing the paint when dry to produce a tough homogeneous film, not liable to break up into powder by exposure to weather or wear."

Messrs. Freeman also exhibit a case of non-poisonous colours (pigments) of almost every variety of shade.

T. B. Orr & Co., London (*Group XIV. No.* 1467).

This firm exhibits specimens of the so-called Hygienic Paints, the principal ones being the "Charlton White" and "Duresco." The processes by which these paints are produced by Messrs. Orr & Co., are somewhat as follows:—"Barytes" (heavy spar), and "Celestine" native strontium sulphate, are finely ground and mixed with ground coal, and the mixture, of a "leaden hue," is repeatedly roasted at high temperatures in four furnaces. The charge drawn from the fourth furnace, and consisting of the sulphides of the alkaline earth metals, is carried to an upper floor in waggons, and then thrown into a large pan and mixed with water. After settling, the greenish solution of the sulphides is pumped up to a large receiver on the top floor of the factory. Meanwhile, on the roof is a cistern in which pure zinc is treated with a mixture of sulphuric and hydrochloric acids, until solution is effected. The metallic zinc is especially made from poor calamine; this calamine sometimes contains copper, which is carefully removed from the zinc, or damage would result. The zinc solution is drawn off by pipes, and conveyed to a tank on the lower or first floor, and into this same tank is drawn the green coloured solution of barium and strontium sulphides from the tank on the upper floor, and the solutions are thoroughly mixed. In the barium tank is usually a large residue of undissolved sulphides and probably undecomposed sulphates. This is taken outside, thrown in heaps, and exposed for some time to the air, when it frequently loses its black sludgey appearance and turns yellowish-green. At this stage it is again furnaced, and then once more lixiviated. The milky liquid obtained in the cistern where the zinc sulphate and chloride are mixed with the barium and strontium sulphides, is run into pans and allowed to settle, when after a time it assumes a semi-solid form, when it is removed and pressed till the mass appears like moist pipe-clay, when it is taken and dried at a gentle heat on stone beds over flues. From these beds the dry pigment, thus chiefly a mixture of barium and strontium sulphates with zinc sulphide, is taken and thrown into a furnace, where it is subjected to an intense heat for several hours, when it is drawn out and plunged into cold water. This treatment is said to confer "solidity" and "density" upon the paint. The paint is now well-ground in water by a grinding stone; as it becomes more and more attenuated, it rises with the water, becoming mixed with it, and overflows through a pipe, which carries the finely-ground white into a second vat fitted with another set of grinders of a different kind. Attached to this second vat is a pump which draws off the white liquid, and conveys it through pipes to another department where it is emptied into a series of capacious cisterns; in these it is allowed to stand until the solid matter is settled out, when the water is syphoned off. The white is then taken out and pressed. The press residue is afterwards taken and placed on small wooden trays made of narrow ribs of wood, and these trays are carried into a drying stove. When completely dried, the pigment is ready for mixing with linseed oil, and is the substance known as "Charlton White." "Duresco" is a so-called distemper, made from "Charlton White," and will, it is said, when applied to walls, ceilings, etc., stand washing extremely well, is non-poisonous, and impervious to damp.

The Continental Diamond Rock Boring Co., Limited (*Group XIV. No.* 1444).

Specimens illustrating a process for manufacturing white lead pigment.

The Patent Liquid Fireproof Cyanite Paint Co., Limited (*Group XIV. No.* 1440),

Exhibits specimens of coloured cyanite. The "Fireproof Cyanite" is a liquid which may be procured either colourless or coloured for staining wood, canvas, felt, etc. It is also used as a priming for paint, varnish, etc. Combustible substances, such as those named, coated with it, are certainly rendered completely uninflammable. Some wood chips sent to the writer, as having been coated with the preparation, were found slightly covered with a whitish powder almost like an efflorescence, and on wetting were found to taste, as well as to react, strongly alkaline. This being the case, the fire-proofing liquid is not unlikely to be a mixed solution of silicate of alumina and silicate of soda (or soluble glass). In any case the chips of wood refuse to burn in a flame, and only slowly char. The wood that has been impregnated was found to have preserved its integrity perfectly. Besides communicating nothing of a poisonous nature to the wood, it is claimed that the treatment with this liquid prevents dry-rot, and that only one coating is needed. According to the testimony of the *Builder*—"Two wooden structures, one only coated with the above-named preparation, the other not coated at all, were fired; the one coated withstood the action of the flames, whilst the non-coated building was destroyed." *Engineering*, referring to the coated building in the experiment, states that "the prepared building was merely scorched." Captain Shaw, C.B., Chief of the London Fire Brigade, considers that "wooden stairs cyanited are, in case of fire, much safer than stone." The small experiment with the cyanited chips certainly bears out this statement, for a similar fragment of stone exposed in a flame to a temperature at which the wood is only commencing to char, would have cracked and flown to pieces.

Messrs. Bolton & Partners, Limited, Bristol (*Group XIV. No.* 1452).

(1.) Specimens of strontia paints, colours and glazes; and (2.) Specimens illustrating certain improvements in the manufacture of caustic soda.

TANNING, LEATHER, GLUE, AND SIZE.

The Eglinton Chemical Co., Glasgow (*Group XIV. No.* 1441).

This firm exhibits specimens illustrating the chrome-tanning of leather, and articles made from the leather so tanned. (See this Journal, iii. pp. 615—620).

T. Nordenfelt, London (*Group XIV. No.* 1439),

Exhibits specimens illustrative of his new methods of extracting albumen, fish-oil, glue, gum, etc., from fish, and of preparing guano from the residue.

B. Cannon & Co., Lincoln (*Group XIV. No.* 1438),

Show samples of concentrated size and glue powders made by their firm.

AGRICULTURE, MANURES, Etc.

The Agricultural and Horticultural Association, Limited, London (*Group XIV. No.* 1455).

Specimens are shown of various improved artificial manures, suitably classified according to the crops which they are intended to promote. An interesting and able account, not suited for reproduction here nor yet for useful abstraction, is presented by the Association, and it treats in detail of the different manures made, the crops for which they are suited, and the proportions of the constituents composing these manures, with prices.

Among certain directions given for the valuation of compound manures by analysis, is one which runs as follows:—

"Great care is required in sampling a compound manure for analysis. A small portion should be drawn from almost every bag, and these small lots carefully mixed together. *All dirt, stones, etc., which would vitiate the result, should be carefully excluded.*" (The italics are the writer's.) After the preceding direction appears the following:—

"As analysts differ in their results, we must claim the right to have a second analysis made by a second chemist, if necessary, and to strike an average of their results." It would seem, however, that the "great care required in sampling" above referred to, would lead the readers of the sentence in italics to regard that sentence in very different lights, according as they are buyers or sellers of a manure! Moreover, not unlikely "analysts differ in their results" more or less in proportion as "great care *is*" exerted "in sampling" by buyers and sellers respectively!

The directions for the use of common salt in manuring are interesting. It is stated that salt should be used in conjunction with almost all manures, whether farm-made or artificial. "It is especially advantageous for mangels, cabbages, kohl-rabi, kale, potatoes, etc. It sweetens pastures, and where used is said to be an antidote to several diseases of sheep and cattle. It is best mixed with manures just before they are used, as otherwise it has a tendency to cause them to get damp." The following various kinds of salt are supplied by the Association:—"Agricultural salt, ground rock salt, clean broad salt, fish salt (containing some ammonia), saltpetre salt (containing some potassium nitrate), hide salt (containing some ammonia)."

In the *directions for use* it is stated: "For potatoes, turnips, mangels, carrots, old-laid grazing lands and sour pastures, from 5 to 10cwt. are sown broadcast in the early spring." "Farmyard manure should be regularly salted, while compost heaps of earth and lime would be greatly improved and give better results by the addition of a little salt." "Nitrate of soda, and similar strong nitrogenous manures, should be mixed with three or four times their weight of salt before sowing." It would thus appear that sodium chloride, by virtue of its ready solubility and osmotic power, plays a part in assisting in the assimilation and digestion of manurial and earth-food by the plant, similar to that played in the animal economy when salt is partaken with food by man.

Edward Webb & Sons, Widnes and Stourbridge (*Group XIV. No.* 1456),

This firm exhibits (1) samples of Webb's manures for all crops; (2) raw materials from which the manures are manufactured.

Clay & Levesley, London (*Group XIV. No.* 1456),

Show samples of Clay's fertiliser, a special horticultural manure.

Edward Packard & Co., Ipswich (*Group XIV. No.* 1454),

Exhibit specimens of concentrated superphosphate, and also phosphates of soda, potash and ammonia, with other compounds, manufactured by processes protected by letters patent (Eng. Pat. 2182, May 31, 1878), in which also the use of a special form of mixing apparatus for assisting in dissolving phosphates, is comprised. The mode of separating the gypsum and solid mass from the superphosphate solution by means of filtering presses, particularly wooden ones; the mode of concentrating the superphosphate solution so obtained, and several other processes connected with the manufacture of superphosphate, etc., are also patented. (See Eng. Pat. No. 6176, April 9, 1884; also Nos. 6750, 6751, and 6752, April 24, 1884.)

The chief feature of novelty is the cheap method of manufacturing a concentrated form of phosphoric acid (superphosphate). If bones be reduced to a meal and added to a syrup of this concentrated superphosphate, and after thorough incorporation the mass be thrown in a heap and allowed to remain for a few weeks, it will gradually dry and become friable, and in a fit state to be applied to the soil. Phosphatic guanos may be treated in a similar manner.

J. Simon-Legrand, Bersée, France (*Group I. No.* 2705),

Apparatus for forcing or germinating grain.

SUGAR, STARCH, GUM, &c.

Edward Packard & Co., Ipswich (*Group XVII. No.* 1564),

Exhibit specimens illustrating their improvements in the manufacture of sugar from cane-juice. These comprise samples of sugar made in the Mauritius under the new process invented by Messrs. Icery, Bernard & Ehrmann, and patented by them. By the use of this process, great economy is claimed as being effected in the manufacture of cane-sugar.

This firm exhibits, further, various reagents used—the processes referred to, including a particular form of phosphoric acid, really a crystalline superphosphate termed "Ehrmannite," which is entirely soluble in water, and the manufacture of which is patented by the exhibitors. There are two qualities of this superphosphate, the "A" quality containing about 55 per cent. of soluble phosphoric acid, and "B" about forty per cent. Before use, the substances are dissolved in cane-juice or water. In these they are easily soluble.

These superphosphates are used in the following way:—The usual process of defecating the cane-juice is carried out by adding lime until the point of neutralisation is reached. The juice is then "over-tempered," half as much lime again being added as had been required to neutralise the raw cane-juice. The solution of the superphosphate is then run in, until the excess of lime purposely used is precipitated, and the neutral point again attained. The resulting liquor, when drawn off, is found particularly clear and free from objectionable extraneous matters. The advantage of the use of the superphosphate arises from the floccular nature of the precipitate it forms with lime, for this mechanically collects along with it all the suspended matters in the juice, throwing them to the surface in the usual process of "cracking" the liquor, as it is termed in the West Indies. The mud from liquor so defecated is valuable for manure from the extra amount of precipitated phosphate of lime it contains.

Bolton & Partners, Limited, London (*Group XVII. No.* 1561),

Show specimens illustrating their improvements in the treatment of saccharine juices, and the manufacture of oxide of strontium for the production of refined sugar direct from beets.

J. A. R. & J. Duncan, and B. E. R. Newlands, London (*Group XIV. No.* 1449).

(1) Alum process for removing potash from saccharine solutions; (2) Improvements in the manufacture of sulphate of alumina.

On referring to Eng. Pat. 2090, 1871, by James Duncan, John A. R. Newlands and Benjamin E. R. Newlands, it will be found it treats of what is commonly known as the "alum process" for removing potash, ammonia, and other impurities from saccharine solutions.

Cold solution of sulphate of alumina is added to the cold syrup in quantity sufficient to form an alum with the whole of the potash present. The mixture is well stirred for a few minutes, and then allowed to repose for a few hours, when the alum falls to the bottom of the vessel, and the clear acid liquor is then removed by decantation.

The acid liquor is next neutralised by milk of lime. The liquor is afterwards heated and filtered. It will then be found that a large part of the mineral matter has been removed, and also a good deal of organic impurities. The alum produced has a ready sale, being remarkably free from iron. During the past few years, five thousand tons of this potash-alum have been produced at Mr. James Duncan's sugar refinery, Clyde Wharf, Victoria Docks, London.

In connection with this process, the following samples are exhibited :—The solution of sulphate of alumina used and the alum produced, the latter in the form of alum-meal and of a large crystalline block. The syrup is shown before treatment, also after addition of sulphate of alumina (with the deposit of alum), and, lastly, after completion of the process.

Eng. Pat. 5287, 1880, by B. E. R. Newlands, covers a process for the manufacture of sulphate of alumina containing very little iron or free acid. Solution of sulphate of alumina, containing more or less impurities, is concentrated until it partially solidifies on cooling, to form a magma, or mass of crystals. This magma is pressed in a filter press, and cakes of sulphate of alumina are thus obtained containing scarcely any free acid, and only a very small amount of iron.

The residual mother-liquor is concentrated by heat till it is sufficiently strong to give a magma of crystals on cooling, and this second magma is submitted to pressure as before, and yields a tolerably pure sulphate of alumina. The same operation may be repeated, and the impure mother-liquor finally left yields a sulphate of alumina containing a considerable amount of iron. This sulphate may be used for the purification of sewage, or for any other purpose for which sulphate of alumina is required, and in which the presence of iron is not objectionable.

In connection with this process the following samples are exhibited :—The Eglinton alum-clay used in making the sulphate of alumina; the concentrated solution of sulphate of alumina with the magma in it; and the first quality, second quality, and residual products obtained.

Gustav Fritsche, Moravia (Agent, P. Born, London) (*Group XVII. No.* 2704),

Show samples illustrating the improved method of the above-named, for refining beetroot sugar-juice.

Adolph List, Leipsic (*Group XVII. No.* 2705*a*),

Exhibits specimens of saccharine made from coal-tar.

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(*A*) FOODS, (*B*) SANITARY CHEMISTRY, (*C*) DISINFECTANTS.

(A) *FOODS.*

Hollandia, Fabrique de Produits de Lait, Netherlands (*Group XVII. No.* 2715).

Samples illustrating the process of this firm for preserving milk and cream without sugar.

This condensed milk is prepared at the manufactory, "Hollandia," near Rotterdam, the only addition to the milk being the required amount of sugar to act as a preservative after the tin is opened, and only the best cane-sugar is employed for this.

The milk is moreover condensed and conserved without the addition of any foreign matter. The condensed cream consists of the pure article.

John Fordred, London (*Group XVII. No.* 1569).

Specimens of (1) Malted food preparations—viz.: (*a*) Allan & Hanbury's malted farinaceous food and malted jelly; (*b*) Hill & Sons' malted nursery biscuits. (2.) Samples of torrefied grain with model—viz.: (*a*) Barley, maize, rice, etc., for brewing, distilling, and vinegar making; (*b*) Maize prepared for horse and cattle food by the Torrefied Grain Company. (3.) C. Spencer & Sons' malted cake for cattle feeding.

(B) *SANITARY CHEMISTRY.*

The Patent Porous Carbon Co., Limited, London (*Group XIV. No.* 1459).

This company illustrates its methods for deodorising sewage, for filtering water, refining sugar, and for the decolourisation and purification of liquids by means of a patent carbon. Plans also of patent carbon closets, etc., are shown.

(C) *DISINFECTANTS.*

H. B. Condy, Battersea, S.W. (*Group XIV. No.* 1445),

Exhibits specimens of (1.) A new permanganate disinfectant, which contains also aluminium sulphate, which, it is said, increases the oxidising effect of the permanganic acid, plays a useful part in neutralising ammonia, and adds antiseptic value to the preparation. In this new disinfectant, all the available oxygen of permanganic acid is utilised, whereas only 60 per cent. of this amount is utilised with the alkaline permanganates. (2.) A new medicinal salt, sodium hyposulphate, and also other hyposulphates.

J. Martin Smith, London (*Group XIV. No.* 1422),

Shows specimens of disinfecting cleansing powder.

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PAPER, PASTEBOARD, &c.

The Chemical Papers Co., Limited, London (*Group XIV. No.* 1460).

Illustrative specimens of (1) improvements in the manufacture of papers and felts for protective, antiseptic and germicidal purposes; (2) moth-destroying papers; (3) anti-tarnish and building papers.

Henry Newall & Sons, Manchester (*Group XXVI. No.* 1986).

Specimens of (1) mechanical and chemical wood-pulps; (2) wood-flour, etc., used in the manufacture of paper, linoleums and other fabrics.

T. Graham Young, Durris, Aberdeen (*Group XXVI. No.* 1992),

Illustrates his chemical process in the preparation of wood-pulp, with suitable samples.

W. M. Riddell, London (*Group XXVI. No.* 2004),

Illustrates the manufacture of paper, paper boards, waterproof paper, and other articles of a fibrous texture from waste bark.

G. F. Green & Co., London (*Group XXVI. No.* 2044).

Specimens of wood-pulp boards and wood-papers made by their firm.

Thompson & Norris Manufacturing Co., Limited, London (*Group XXVI. No.* 2043),

Exhibit samples illustrating their improvements in the manufacture of corrugated paper to be used as a packing material and parcels post wrapping.

THE DANZIGER CELLULOSE FABRIK (AGENTS, C. F. GREEN & Co., LONDON) (*Group XXVI. No.* 2653).

The following are the details of this exhibit :—

1. Specimens illustrating the stages of the manufacture of chemical wood-pulp (soda process).
2. Samples of pulp manufactured by the new sulphate process, and of paper produced from this material.
3. Samples of wood-pulp boards and fancy boxes made from them.
4. Samples of pure wood middles for card-making.
5. Samples of tinted wood cartridge-paper or boards for tickets, etc.
6. Samples of pure wood wrapping-paper.
7. Samples of mechanical wood-pulp.

(Nos. 4, 5 and 6 are made from this kind of pulp—*i.e.*, mechanically-ground wood).

FINE CHEMICALS, ALKALOIDS, ESSENCES AND EXTRACTS.

BRIN FRÈRES, PARIS (*Group II. No.* 138).

THE INDUSTRIAL PRODUCTION OF OXYGEN AND NITROGEN, AND THEIR SEPARATION FROM ATMOSPHERIC AIR.

Anhydrous barium oxide is first prepared, then placed in a kind of tabular retorts arranged in series, and heated to between 500° and 600° C., atmospheric air, which has been previously deprived of carbonic acid and moisture, being passed over it. The oxygen is absorbed, barium peroxide is thus produced, and the partially-exhausted air is passed through other retorts of the series until at length all the oxygen is said to be absorbed, and nitrogen passes on to a gasholder. The temperature is regulated by means of a pyrometer specially constructed, so that at the end of the pyrometric bar a lever is fixed which holds a suspended disc, so adjusted as to proportion exactly the mixture of air and carbonic oxide employed as fuel. This bar, in expanding, closes the disc-valve or clapper which admits the air to the furnace, and there is at once a fall of temperature to 500° When the pyrometric bar contracts, the valve is again open, and the temperature rises to 800°, and at 800° deoxidation of the barium peroxide produced is said to take place, pure oxygen being of course evolved. Thus great regularity in the heating of the retorts is said to be obtained, a considerable saving in plant through the danger of overheating being prevented, not to speak of the perfection in working, all independent of the attention given to the furnaces by the workmen. The apparatus works in a precise, because in an automatic way; for a disc or a single valve when shut virtually produces the peroxidation, and when open, the deoxidation, by the action of the pyrometric bars already mentioned. Messrs. Brin Frères calculate that 1 kilo. of anhydrous barium oxide produced by their process will give at the first operation 25 litres of oxygen. The production will increase from day to day, and they have observed that after eight days of continuous working this same kilo. will produce 68 litres of oxygen. They claim, therefore, that in a regular course of production, they can count upon an average return of 50 litres of pure oxygen for every kilo. of anhydrous barium oxide for each operation.

Description of the Apparatus.—The barium oxide is placed in iron retorts, set in horizontal layers or batteries. These retorts have at each of the ends metallic friction joints. For the complete demonstration of the process, Messrs. Brin Frères have at their shed in the Exhibition coupled two furnaces, each with 15 retorts of 2·80 metres in length, and 0·16 metres diameter inside measure. Two double-acting pumps communicate with these batteries, one of the pumps drawing air into the retorts, and so into contact with the barium oxide, when peroxidation takes place. The other pump creates a vacuum in the retorts at the proper time, and when the temperature rises to 800°, and draws off the oxygen, which had combined with the baryta, to form peroxide of barium. The air before entering the retorts is deprived of carbonic acid and moisture by passing it through the chambers of an apparatus containing quicklime or caustic soda. The coupling of the two furnaces allows of the direction, by means of pipes and valves, of the peroxidation or deoxidation, or one or other of the two furnaces, as may be desired.

The experimenting establishment of Messrs. Brin Frères is large enough to enable them to produce 100 cubic metres of pure oxygen per diem, and this is of course more than mere laboratory work.

The oxygen produced is quite free from the small quantities of chlorine found in the gas generated from potassium chlorate, and which interfere with its use for medical purposes.

The Nitrogen; its Collection and Employment.—A simple change of valves at the outlet of the retorts makes it possible to send each gas into its respective gasometer. For every cubic metre of oxygen about four cubic metres of nitrogen are obtained. The latter element it is proposed to utilise, and the method to be adopted is experimentally illustrated by the exhibitors. The medium, or reagent, chosen for effecting the synthesis of the nitrogen and hydrogen is a very thorough mixture of finely-divided carbon and caustic baryta. This mixture is placed in retorts, and nitrogen, previously rendered moist by bubbling it through water, is passed through them, their temperature being maintained at 150° C. The steam at this temperature is, according to the inventor, decomposed, the affinity of baryta for carbonic acid being apparently powerful enough to determine the formation of the latter, whilst nascent hydrogen unites with the nitrogen, forming ammonia, which, passing on, is absorbed by sulphuric or hydrochloric acids, or otherwise treated.

VARIOUS APPLICATIONS :—*Oxygenised Water.*—Oxygen is forced into water under high pressure, and a beverage is produced, which, it is said, medical men have experimented with very successfully in the amelioration or cure of certain disorders. That the water is charged as stated, is easily proved by the simple experiment with a red-hot match on opening the tap of one of the syphon-bottles containing the oxygenised water.

Metallurgical Applications.—The usefulness of the pure oxygen in conjunction with hydrogen, for producing the intensely-hot oxy-hydrogen flame, is illustrated in a variety of interesting operations and specimens exhibited.

Light.—The Drummond light is shown, as produced with a flame yielded by pure oxygen and hydrogen, and it is suggested that this beautiful light would become more generally applicable and useful were pure oxygen so cheaply and easily obtained as the exhibitors believe their process would enable it to be.

Ozone.—It is pointed out by the exhibitors that the production of pure oxygen on the large scale would probably soon lead to the attention of scientific and practical men being drawn to the preparation of ozone by the action of the electric current on oxygen, or otherwise, and to its employment in the medical treatment of certain complaints.

GEORGE BARTH & Co., LONDON (*Group XIV. No.* 1437),

Exhibit (1) apparatus for the administration of nitrous oxide gas in combination with ether; (2)

portable apparatus for the inhalation of oxygen or other gases in combination with atmospheric air.

John Orchard, London (*Group XIV. No.* 1432),

Shows specimens of compressed and liquefied gases, valves and bottles.

Mackey, Mackey & Co., London (*Group XIV. No.* 1446),

Show a fine set of specimens of neutral soluble salts of cerium for medicinal purposes, comprising the following:—Ammonio-citrate of cerium, ammonio-tartrate of cerium, potassio- and sodio-citrates and tartrates of cerium, lactates of cerium.

The mineral used as the source of cerium is cerite, which is chiefly composed of silicates of cerium, lanthanum and didymium, the oxide of cerium on the average present being 39 per cent.

The first introduction of cerium as a therapeutic agent appears to be due to Sir James Simpson, who recommended cerium oxalate as a specific against obstinate cases of vomiting, and its good effects Simpson found not to be confined to the forms of vomiting which depend on the sympathetic derangement of the stomach caused by changes functional or pathological, in the uterus or other organs, but which are manifested also in those forms of the complaint which are due to different morbid conditions of the stomach itself. He expressed the opinion that other salts of cerium would answer as well as the oxalate; but this salt was the one then most easily procurable. "The action of cerium on the stomach seems to be that of a sedative tonic, resembling, in some degree, the action of salts of silver or bismuth, and I have" (writes Simpson) "seen it successful in curing the most obstinate cases of vomiting. The effect is sometimes instantaneous, sometimes the vomiting ceases after a few doses, sometimes not until the remedy has been persevered with for several days."

The "Liquor Ceric cum Bismutho," a specimen of which is shown, is said to be a very powerful specific at present recommended for the prevention or reduction of vomiting.

Howards & Sons, Stratford, E. (*Group XIV. No.* 1467).

Alkaloids.—This firm exhibits exceedingly fine specimens of cinchona barks and alkaloids; also an interesting variety of salts of certain organic acids and alkaloids useful in pharmacy. The samples of bark shown illustrate the great change which the introduction of cultivated bark has brought about in the quinine industry. In 1862 South America was looked to as the source of cinchona bark as a matter of course. At the present time, however, the East India barks are almost entirely worked. There still remains a great deal to be done in choosing the varieties, and in cultivating the bark to the best advantage. Ten and twelve per cent. of quinine sulphate are not unusual yields from picked trees, and there is no reason to think that the maximum is reached; while the renewing process, which was discovered by Mr. McIvor, has enabled the growers of *Cinchona Succirubra* to double the yield of quinine. The alkaloids exhibited by this firm are novel as to purity. The various alkaloids found in commerce are now completely separated, and ought to be obtained of a degree of purity far greater than was the case formerly. Amongst the salts of quinine shown, the following immediately strike the eye of the chemist:—*Chlorate of quinine, salicylate of quinine, iodide of quinine, acetate, and valerianate of quinine.*

Interesting specimens are shown of crude China and Japan camphors, the Japanese article, as regards whiteness and apparent purity, decidedly bearing the palm.

Samples of camphor cakes are also exhibited. They consist of compressed camphor, and the effect of the compression is to produce a mass resembling in its structure and appearance glacier ice, the process furnishing an example of true regelation.

Iodoform.—Till within the last few years iodoform was merely a chemical curiosity, but now it is become of great value in surgery, and is used in enormous quantities, and with most remarkable results.

A beautifully-crystallised specimen of iodoform is exhibited by Messrs. Howard.

May & Baker, Battersea, S.W. (*Group XIV. No.* 1467),

Exhibit some of their finer chemicals. Gallic and tannic acids are shown, with a specimen of pyrogallol in beautiful white crystals. Benzoic acid prepared from "gum benzoin," with a series of benzoates, amongst which a finely-crystallised specimen of benzoate of ammonium ($NH_4C_7H_5O_2$) is worthy of notice. The mercurial preparations form a complete and exceedingly well-crystallised set, and the bismuth compounds are crowned by a beautifully-crystallised specimen of the metal.

Messrs. May & Baker also show specimens of the recent pharmaceutical novelty—viz., true oleates obtained by precipitation, which, besides possessing the advantage of reliable composition, are probably in a form most convenient for the production of effective ointments. These metallic oleates are variously-coloured pasty masses. A specimen of pure oleic acid is also shown. The "Sublimed Transparent Tablet Camphor" exhibited by this firm appears in all shapes and sizes. Some of these tablets, indeed, bear considerable resemblance to Iceland spar, and by a modification of the process, indelible lines and marks are produced throughout the blocks, taking the form of monograms, designs, etc. A mould or "template" in sections is shown to illustrate the patented method of "working" up the metallic bomblows used in subliming into the ring form, the older form of sublimation being illustrated by a small ring or "bell" of camphor and "bomblow."

Hopkin & Williams, London (*Group XIV. No.* 1467),

Exhibit specimens of their manufacture of fine chemicals.

A series of samples of metallic oleates is shown, almost all of them being in the dry form. The series has certainly the appearance of a remarkably fine set of preparations.

The copper sulphate is purified by a novel process, and is perfectly pure.

Its entire freedom from iron is easily proved by supersaturating a solution of some of the salt in water with ammonia, and allowing it to stand for some hours, when any iron present will be deposited.

The specimens of bichromate of ammonia and sulphocarbonate of zinc represent preparations largely made by this firm.

By many medical men the salicylic acid, which is the natural product obtained from the oil of wintergreen (*Gaultheria Procumbens*) is considered superior to that obtained synthetically and artificially from carbolic acid, which may possibly not always be quite pure. A specimen of this natural salicylic acid in very fine crystals is exhibited, and a series of salicylates all prepared from the natural acid. It is needless perhaps to remark that the salicylates usually found in commerce are now prepared from the synthesized salicylic acid. The following is a list of the specimens shown by Messrs. Hopkins & Williams :—

Potassium chromate (pure).
,, borotartrate.
Camphor monobromide.
Silver oleate.
Copper ,,
Iron ,,
Zinc ,,
Cadmium ,,
Aluminium ,,
Mercury ,,
Nickel ,,
Tin ,,
Arsenic bromide.
Anthraquinone (sublimed).
Alizarin, artific. (sublimed).
Zirconia (pure).
Barium nitrate (pure).
Iron (ammonia) alum (pure).
Zinc sulphocarbolate.
Copper sulphate (pure)
Sodium chlorate (pure).
Calcium benzoate.
Quinine hydriodate (soluble).
Chromic anhydride.
Lead iodide (crystallised).
Chromium chloride (sublim'd)
Cantharidine.
Coccaine (pure)
Accenitine (pure, English).
Mercuric iodide (biniodide), sublimed.
Sodium nitroprusside.
Ammonium bichromate.
,, chromate.
Urea, pure.
Theine.
Salicylic acid (natural).
Sodium salicylate (natural).
Quinine ,, (,,).
Cinchonidine ,, (,,).

ROBERT H. DAVIS, CHEMIST TO THE SOCIETY OF APOTHECARIES, APOTHECARIES' HALL, LONDON (*Group XIV. No.* 1467),

Exhibits a collection of chemical and pharmaceutical preparations illustrative of the employment of this class of agents by the medical profession of this country. The specimens include some typical preparations of pharmacy which have long been in use, such as tinctures and extracts, as well as the most of those more recently-introduced remedies such as iodoform, kairine, antipyrine, paraldehyde, etc., that must at present be considered to be upon their trial, since they have not yet received the seal of full official approval, granted by a place in the National Pharmacopœia.

THE WASHINGTON CHEMICAL CO., DURHAM (*Group XIV. No.* 1467),

Shows specimens illustrating its manufacture of fine chemicals.

W. LASCELLES-SCOTT, ESSEX (*Group XIV. No.* 1460).

Diagrams showing improvements in apparatus for the preparations of pharmaceutical and other extracts.

THOMAS CHRISTY & CO., LONDON (*Group XIV. No.* 1467),

Show specimens of their fine chemicals and pharmaceutical preparations. The following is an account of some of the more interesting of these. *Doundaké Barks.*—Under this name several barks obtained from the West Coast of Africa have been examined in France. One of these is identical with the bark of a root coming from Siberia, and known as peach root; it is obtained from *Sarcocephalus Esculentus*, a plant belonging to the cinchona family. Messrs. Heckel and Schlagdenhauffen consider it capable of replacing cinchona bark as an astringent and febrifuge, and also regard the beautiful yellow colouring matter contained in the bark as worthy the attention of dyers. According to these authorities the Doundaké plant is found from 16° N. latitude to 5° S. latitude, from Senegambia to the Gaboon. The bark from Sierra Leone has a greyish smooth surface, cracked here and there, and presenting small hard excrescences of a darker colour. When older the bark becomes blackish, the cracks multiply, and the epidermis falls off as a reddish dust. The interior of the bark is of an ochrey yellow, and is situated longitudinally. The bark has a bitter taste, and when chewed gives a yellow tinge to the saliva. The bark from Rio Nunez is similar, but has no blackish excrescences, and the internal surface is darker yellow. The bitter taste is due to two nitrogenous principles of a resinoid character, differing in their solubility in alcohol, and having the respective formulæ $C_{28}H_{19}NO_{13}$ and $C_{16}H_{16}NO_{6}$. The bark also contains a tasteless crystalline principle soluble in caustic potash, and also glucose and traces of tannin. It appears that another variety of Doundaké was examined by MM. Bochefontaine, Féris, and Marcus, and found to contain a poisonous principle, and the bark of this poisonous species was of an *orange red colour*. To prevent confusion with the tonic and febrifuge bark, it would be best doubtless to retain for the latter the name "African Peach Root."

Gouania Domingensis.—This plant contains a principle which renders it most valuable for the manufacture of tooth preparations of a similar kind to floriline. A specially-useful gargle has been prepared from it. In the United States the stem of the plant is cut into pieces about six inches long, and each piece is bruised at one end and used as a tooth-brush. The effect is said to be very strengthening to the gums, as well as cleansing to the teeth.

Gutta-Percha.—A specimen is shown of a new species from a tree, the botanical name of which has not yet been ascertained. According to Sir Joseph Hooker (Kew Report, 1881, p. 38), the time cannot be far distant when the natural sources of gutta-percha will be definitely used up. It is therefore most important that the gutta-percha tree should be planted in colonies where it will grow, as it will doubtless in the future prove a source of considerable profit. Unfortunately the best gutta-percha tree is of very slow growth, and it has become so rare that it is difficult to obtain seeds. There are, however, other trees of more rapid growth which yield gutta, and which are worthy of attention. One of these which yields gutta-lundek has recently been identified by Dr. Trimen as *Payena Leerii*. The tree grows in swampy places near the coast, even where the water is salt, and land of this character can therefore be turned to account by the planting of this valuable tree. As yet no means have been discovered of obtaining the whole of the gutta from the bark, indeed it is calculated that only one-thirtieth part of the juice contained in the bark is obtained by incision. It has been proposed, however, to strip off alternate layers of bark, pound them and boil with water. It is thought that in this way the whole gum might be obtained. Various kinds and qualities of gutta-percha are afforded by different sapotaceous trees, but the pure red gutta-percha of Borneo, which is considered to give the best quality, is yielded by *Dichopsis Gutta*. This species is characterised by trees of red and rough stems, generally found among old jungle on the hill sides, growing to a height of 100 to 150 feet, with a diameter varying up to 3 feet. The natives on finding a tree, say 12 inches in diameter, proceed as follows :—They fell it, cut off the top, and ring the bark at distances of about a foot. The sap gradually drains away for about two or three days, and is collected in any convenient vessels, such as leaves, cocoa-nut shells, etc., from which it is transferred to a pot and boiled with a little water for half-an-hour or so. The milk is boiled to prevent it from hardening on exposure to the air, as if allowed to do so it becomes comparatively valueless. It is very difficult to estimate the yield, as the quantity varies so much according to the size of the tree and the time of the year, the flow of sap being greatest when the tree is producing most leaves. A small tree will yield generally 33⅓lb., while the largest may yield even as much as 100lb. The red gutta is often mixed with the inferior product of other species. Another species, *Dichopsis Macrophylla*, yields an inferior gutta of white colour. It is of smaller growth than the *Dichopsis Gutta*, being 50 to 60 feet high, and differing slightly in the foliage. The gutta beds are being gradually exterminated, as they are of slow growth, and the natives do not take the trouble to plant seeds or cuttings. *It becomes most important, therefore, that the tree should be planted in suitable localities in the British colonies, and it is moreover highly probable that by proper cultivation and care the variation in the yields of gum could be prevented by the attainment of a tolerably uniform maximum yield.*

Hydrocotyle Asiatica.—The leaves of this plant are usually administered in the form of a powder, which is obtained by removing the stalks from the fresh leaves and then drying the latter in the shade in the open air. Thirty pounds of fresh leaves yield about three or four pounds of the powder. Hydrocotyle contains a peculiar principle called "vellarin," which is an oily liquid, not volatile, and possessing the odour and taste of the herb. It is recommended as a poultice to stimulate ulcerated surfaces to healthy action, as snuff in cases of ozæna, and as an ointment mixed with lard in cases of skin disease. It is also well spoken of when used in cases of secondary syphilis, leprosy, etc.

Jatropha Curcas.—This is a seed, the oil of which should certainly be experimented with by soap makers, as well as by the medical profession. The oil possesses properties resembling those of castor oil, but not the disagreeable smell of the latter. It has an agreeable almond-like taste, and 30 to 60 drops act as an efficient purgative. The plant forms an excellent hedge, as cattle will not eat the leaves, and cuttings rapidly take root. It is indigenous to tropical America, but is found almost everywhere in warm climates. The seeds are regularly exported to Portugal from the Cape de Verde Islands to the extent of about 350,000 bushels annually, for the expression of the oil. Before expression the seeds are slightly roasted and crushed, when the shells are easily removed. 1000lb. of seed give 640lb. of kernels yielding about 260lb. of oil. From Portugal the oil appears to find its way to France, *probably for the manufacture of transparent soap.* The oil could be obtained in any quantity for manufacturing purposes. The juice of the fresh plant is a valuable hæmostatic, and is said to rapidly coagulate the blood even in an artery, so that it can be probably used for the cure of aneurism.

Kava-Kava.—This extract has just recently been suggested to the exhibitors as a rapid and certain cure for gout and gonorrhœa, and is now being experimented with in the London Hospitals. It is also claimed for it by a gentleman, who resided for some time in Fiji, that it has the power of adding the quality known as "age to the rawest whisky" very rapidly. This statement is one worthy of experimental investigation.

Kola Nuts and Paste.—Kola nuts are now coming largely into use for a variety of purposes, the most important form being that of the paste, a sample of which is shown. This paste, which could not easily be distinguished from ordinary cocoa-paste, contains a little over 2 per cent. of caffeine, and forms therefore a stimulating food of great value. It is important to remember that the paste shown is made from the kola nut without any mixture whatever. If this paste, which is five times as strong as cocoa, be added to the lowest quality of the article, it raises this quality so as to render it equal to that of the best Caraccas cocoa. Owing to the abundance of caffeine in this paste, it is said to be of the greatest service in counteracting the effects of drink, by restoring clearness to the head. It is said that after chewing the Kola nut on the West Coast of Africa for the purpose just named, a drunkard cannot return to stimulants for some days without feeling nausea. If this be so, a judiciously-prescribed diet of kola nut would suggest itself from the preceding, as possibly offering a practical and valuable solution of a difficult problem for a considerable percentage of the inhabitants of the British Isles!

Menthol Cones are shown in a variety of patterns to suit all markets, and are made of pure menthol crystals without admixture. The best menthol is the Japanese from the plant *Mentha Arvensis var. Piperascens*, and it contains more of the oil of peppermint than any other varieties.

Papaine forms an important solvent, and is obtained both in the form of a white powder and of a dried juice, and is known commercially as Papaine-Christy. It is made specially from the fresh milk of the fruit of *Carica Papaya* for Mr. Christy by a chemist residing on the Papaw plantations. Papaine has been proved by Prof. Finkler, of Bonn, to be capable of dissolving in pure water 1000 times its weight of fresh fibrin. Finkler states that it dissolves very rapidly the membranes of diphtheria and croup, and that not a single patient he has treated in the University Hospital or in private practice has died, but that all have recovered. In every case the membrane was dissolved by painting it with papaine about five times a-day. He further adds that since "papaine can be applied with salicylic acid, which increases its action, he maintains that there is no other drug in existence equally powerful for the purpose stated." Finkler found that when the membrane was dissolved the fever disappeared. According to the *Berliner Klinische Wochenschrift*, Dr. Schoffer, who has tried most of the remedies recommended for diphtheria, has obtained the best results with papaine. Last summer (1884) he treated 47 cases of this deadly complaint with a 5 per cent. solution of it. He begins the treatment as soon as possible, and orders the patches to be painted every five or ten minutes; in a few hours the membranes are said to be removed, and at the same time the fever disappears.

Pine or Spruce Extract (Christy). This has been tried in a London hospital, and proved to be of the utmost service in kidney and bladder diseases.

Pine Extract for Baths, is an extract made from the fir or pine. It is dissolved in boiling water, and the solution is added to the bath-water. The medicinal and strengthening properties are, it is said, very beneficial, especially for children, and the aroma is extremely pleasant.

Cinchonamine.—This is likely, it is stated, to become a very important drug, both therapeutically and chemically.

Cuprea bark has been imported in large quantities into London for the last few years. It consists of several varieties, two of which have a marked difference in their chemical composition. The one, *Remijia Pedunculata* contains quinine and homoquinine, the other, *Remijia Purdieana*, contains little or no quinine, but an alkaloid named cinchonamine by its discoverer, M. Arnaud. (*Compt. Rend.* xcvii. 174.) Cinchonamine combines readily with acids, forming salts which crystallise well, are only slightly soluble in water, especially in presence of excess of acid. They are more soluble in hot alcohol. The property possessed by the anhydrous hydrochloride of crystallising very readily, is used as a means of separating the alkaloid easily from the other alkaloids of the bark. The nitrate also crystallises with extreme facility, and is almost insoluble in acidulated water. The crystals are well-defined and easily recognisable. It is proposed to turn this property to account analytically, by using cinchonamine as a test for nitrates. Iodides must, however, be first removed by addition of silver acetate. For testing Arnaud prefers to use the hydrochloride.

He thinks the method may be very useful in solving certain problems connected with vegetable physiology, such as the formation of nitrates in plant tissue and their circulation and metamorphosis in different parts of the plant. (See *Pharm. Journ.* [3], xiv. 162.)

ARNOLD SPILLER (*Group XXIX. No.* 2254)

Exhibits photographs developed by means of hydroxylamine and various alkalis. A gelatino-bromide film is prepared, also gelatino-chloride of silver transparencies, developed with hydroxylamine and various alkalis.

A prize of considerable value has already been offered in Mülhausen, in Alsace, for a good commercial method for preparing hydroxylamine, and this application to photography by Mr. Spiller would add further value to such a discovery.

EUGENE RIMMEL, LONDON (*Group XIV. No.* 1436),

Exhibits (1) Working model of Rimmel's Myrogene, a new apparatus for extracting the perfume from fresh flowers; (2) Specimens of new sanitary perfumery; (3) Toilet articles.

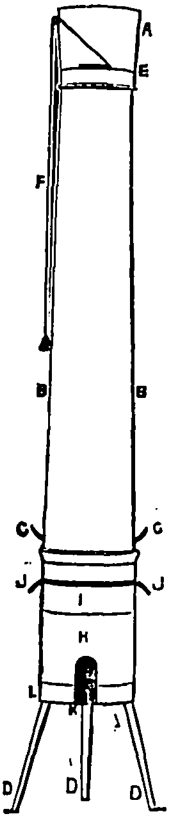


Fig. 1.

The Myrogene consists of three bodies (Fig. 1) A, B and C, fitting into each other, and forming a column which rests upon three feet D. The upper body is a reservoir to contain the prepared alcohol, with a cover on the top, and a bottom pierced with small holes, above which is a valve E, set in motion by a string F, worked on a pulley. The body B is a long case through which the alcoholic shower passes without being exposed to evaporation. At the lower extremity are two external catches CC. Inside the body CC slides a cylinder H, carrying on the top a movable sieve I to receive the flowers, and at the bottom a tap, through which the extract is drawn off. The cylinder H fastens on to the catches G by means of hinged hooks J, which are turned down when the sieve requires removing or replacing. In order to make the apparatus more secure, it is advisable to erect it in the corner of a room, and make it fast to the walls by means of a piece of wire tied round the body B. The model shown is a nickel-plated and elegant piece of apparatus (see Fig. 2).

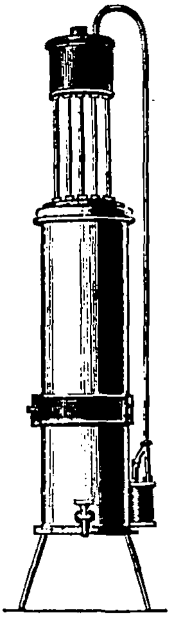


FIG. 2.

Mode of Operation.—Unfasten the hooks J (Fig. 1), and let the cylinder H slide down; take out the sieve I, and fill it with freshly-gathered flowers, carefully picked, removing all the green and leaving only the petals, pistils and calyx. Replace the sieve in the cylinder, raise it up and refasten it to the catches G. Fill the upper reservoir A with prepared alcohol, pull the string F, and as soon as the liquid has passed through the flowers, draw it off through the tap K, and repass it twice in the same way over the same flowers. Let the sieve be again filled with fresh flowers, and repeat the operation until the alcohol is sufficiently impregnated. The usual proportion for one pound of flowers divided into three or four portions, is one pint of alcohol, but it is impossible to lay down a general rule, as the quantity of flowers necessary to produce a strong extract naturally depends upon the intensity of their aroma, which also varies according to the climate. Thus cassie and jonquil yield a powerful perfume with a single operation, whilst violets and mignonette must undergo at least four. Flowers that have been operated upon are drained in a covered filter to lessen the loss of absorption; they may afterwards be submitted to moderate pressure, but the extract then drawn off is of inferior quality. All flowers possessing odour can be successfully treated by this process, but alcohol alone does not suffice to fix their aroma in a permanent manner; it requires for that to be mixed with another ingredient, in the proportion of one ounce of the latter to the gallon of ordinary alcohol, in order to give the prepared alcohol. This ingredient, or "chemical basis," as it is termed by the exhibitor, is specially prepared and sold by him and his agents.

EXPLOSIVES.

Nobel's Explosives Co., Limited, Glasgow (*Group XXV. No.* 1899).

Nitroglycerine has been successfully applied by Capt. Alfred Nobel to explosive purposes as effected by detonation, and to this end the method of manufacture involves important details. Specimens illustrating (1) dynamite and blasting glycerine, (2) detonators, and (3) electric fuses, are shown, the products of the above well-known firm.

The Schultze Gunpowder Co., Limited (*Group XXV. No.* 1900).

Specimens are shown of the Schultze's patent smokeless gunpowder, made from wood. It is a perfectly white substance, in a granulated form. Wood is rendered explosive by being nitrated, and the product is then granulated. Cartridges charged with it are shown.

ANALYTICAL CHEMISTRY.

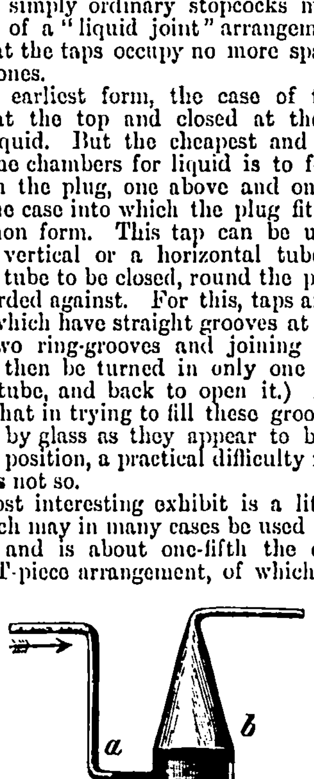
Arnold Eiloart, London (*Group XIV. No.* 1467),

Exhibit specimens of patent airtight stopcocks.

These stopcocks were devised principally to prevent the possibility of leakage occurring in the manipulation of gases in chemical experiments. They are simply ordinary stopcocks made airtight by means of a "liquid joint" arrangement, so contrived that the taps occupy no more space than the ordinary ones.

In the earliest form, the case of the tap was cupped at the top and closed at the bottom to receive liquid. But the cheapest and best way of making the chambers for liquid is to form annular grooves in the plug, one above and one below the bore. The case into which the plug fits is then of the common form. This tap can be used to close either a vertical or a horizontal tube. Leakage along the tube to be closed, round the plug, has still to be guarded against. For this, taps are shown the plugs of which have straight grooves at right angles to the two ring-grooves and joining them. (The plug may then be turned in only one direction to close the tube, and back to open it.) It might be thought that in trying to fill these grooves, entirely closed in by glass as they appear to be, when the plug is in position, a practical difficulty must occur; but this is not so.

The most interesting exhibit is a little arrangement which may in many cases be used instead of a stopcock, and is about one-fifth the cost of one. This is a T-piece arrangement, of which one branch is a tube of half-inch bore into which a smaller tube *a* is fused at right angles; half-an-inch below the joint the wide tube is open; half-an-inch above the joint it begins to taper off (at *b*). An indiarubber plug *c*, not tapering, and covered with a layer of mercury, is pushed upwards past the joint, and so completely shuts off the passage of gas from the side tube, into which also some mercury flows. The passage is opened by slightly lowering the plug. Thus the gas is never in contact with the rubber, but only with glass and mercury.



Addendum to Report of the Exhibit of Messrs. Chapman & Messel. (See p. 520.)

MANUFACTURE OF ANHYDROUS SULPHURIC ACID.

Dr. Messel made his specific gravity determinations at the temperature of 80° F., where all the anhydrides are liquid, though afterwards calculating the results of these to specific gravities at 60° F., when some of the anhydrides become crystallised. It was thought that the readers of this report would be interested in comparing the actual table of results obtained at 80° F., and Dr. Messel has kindly furnished these numbers. The complete table should therefore appear as follows:—

Specimens.	Percentages of SO_3	Specific Gravities.	
		At 80° F. (26·6° C.)	Calculated to 60° F. (15·5° C.)
——	8·3	1·842	1·852
Liquid	30·0	1·930	1·940
Crystalline mass resembling nitre	40·0	1·956	1·970
	44·5	1·961	1·975
	46·2	1·963	1·977
——	59·4	1·980	1·991
Liquid	60·8	1·992	2·006
	65·0	1·992	2·006
	69·4	2·002	2·016
Crystallised	72·8	*1·984*	*1·988*
	80·0	*1·959*	*1·973*
	82·0	*1·953*	*1·967*

Communications.

ON THE ESTIMATION OF SULPHUR IN PYRITES,

BY JOHN CLARK, PH.D.

In the July number of the *Journal of the Society of Chemical Industry* (page 449), Prof. G. Lunge makes some remarks on my process for the estimation of sulphur in pyrites, and states, as his objections, that it estimates the sulphur in galena, and the sulphates of lime and baryta, whilst in the wet process nearly the whole of the useless sulphur is left behind in the insoluble; and I presume that in his opinion this is the cause of the difference between the wet and the dry process. Now, the samples of pyrites upon which I operated contained no weighable quantity of sulphate of barium, less than one per cent. of lead, and from ·1 to ·2 per cent. of lime. In fact, they were typical samples of shipments of Spanish pyrites. I admit that the sulphur in the galena and sulphate of lime is estimated by my process, but it is also estimated by the modification of the wet process employed by the chemists of the Tharsis Company and by Mr. Tatlock, with which alone my process has